

Speed Reading: Portfolio Tracking in a Recession

Conference paper

30 June 2009

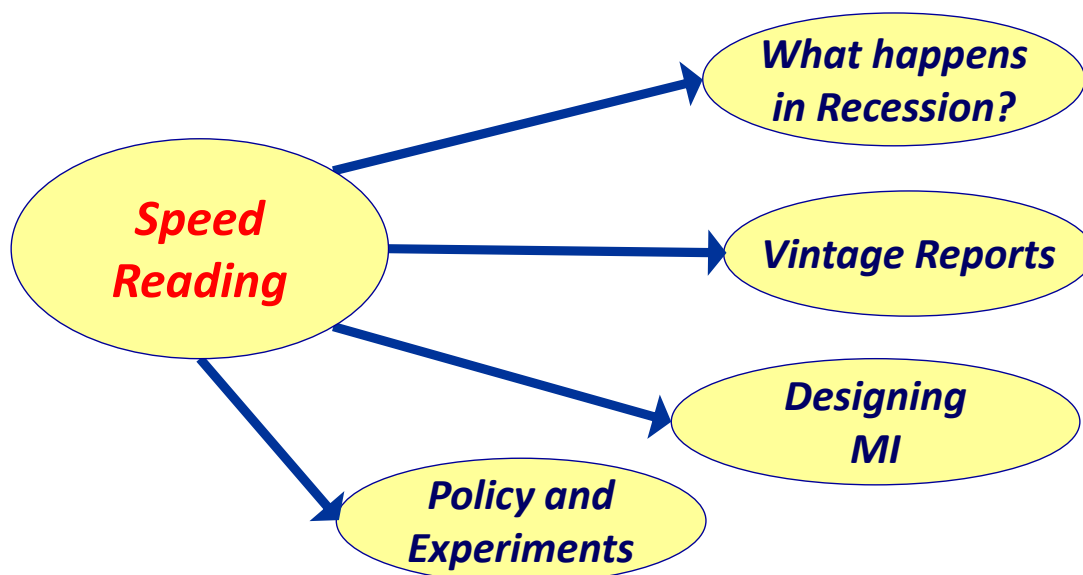
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→ data → information → profit

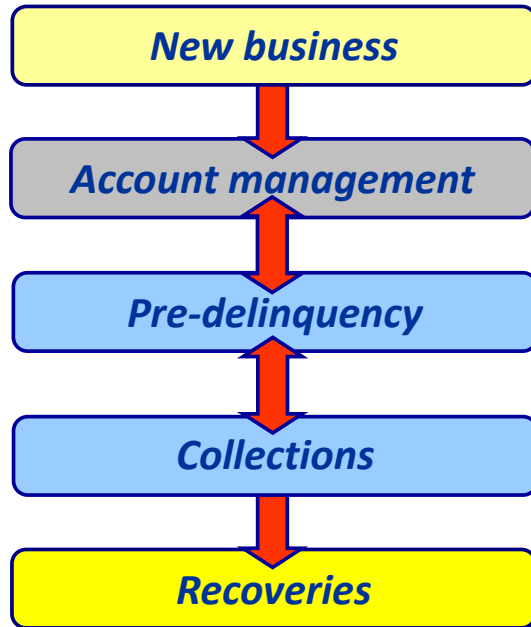
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Speed Reading: Structure of Presentation



Using portfolio tracking in a recession

What happens in a recession?







- *Volume declines*
- *Reduction in demand*
- *Score profile improves*

- *Increased balances – bad risks*
- *De-leveraging – especially good risks*
- *Reduced appetite for credit*
- *Average Balances go down*

- *Deterioration in cure rates*
- *More entries to collections*
- *Drivers: unemployment*
 - *... and underemployment*
- *Interest rates remain low*
 - *different from previous recessions*
- *Certain parts of population unaffected*
 - *e.g. public sector*

- *Payments slow down*
- *Slowest to come out*

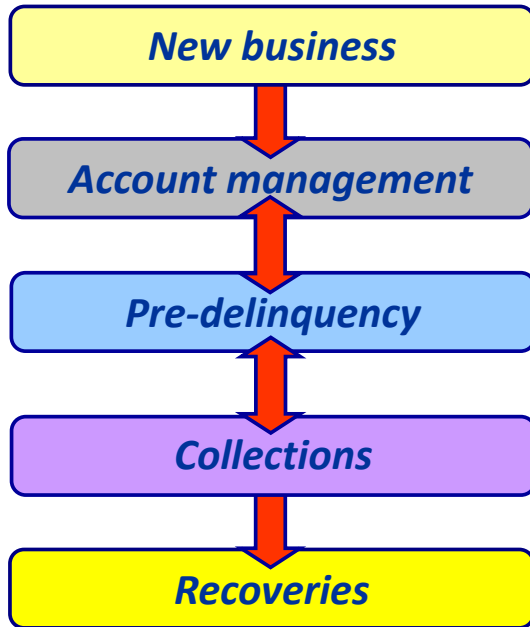
Portfolio mix in recession

- **Earliest effect on unsecured loans** 
- **Poor performance of consolidation loans**
 - **and re-financing** 
- **Most serious on mortgages**
 - **but hits later in time** 
- **Credit cards less affected**
 - **balances grow on bads** 

Position for resilience

Management Actions

Mitigate risks

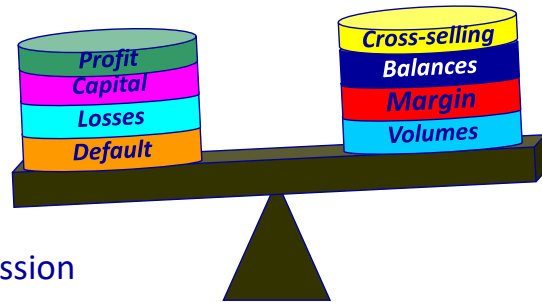


- Price changes
 - Reduce marketing spend
 - Cut-offs
 - Sustainability of income
 - Change scorecards?
- More selective limit increases
 - Improve margins - selectively
- Create priority relationships
 - Reduce limits on high risks
 - Assess longer-term prospects
 - Update LTV estimates
- Intensify early collections
 - Use payment plans
 - Consolidate onto mortgage
- Partial settlements
 - Bear the pain

Management Balance

Limit losses <-> Preserve potential

- Portfolio Mix
 - Grow margins to cover losses
 - Build customer loyalty
 - Position for recovery
 - Cheap to buy market share in recession
- Design products to reduce volatility
 - Fixed/variable rates
 - Link savings to future borrowing rights
 - Next challenge: inflation



Key Competitive Factor: Speed of Corporate Response

Scoring and Competition

... speed of response

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INNOVATIVE
- new products
- delivery channels

INDIVIDUAL
- adapt to niches
- automated

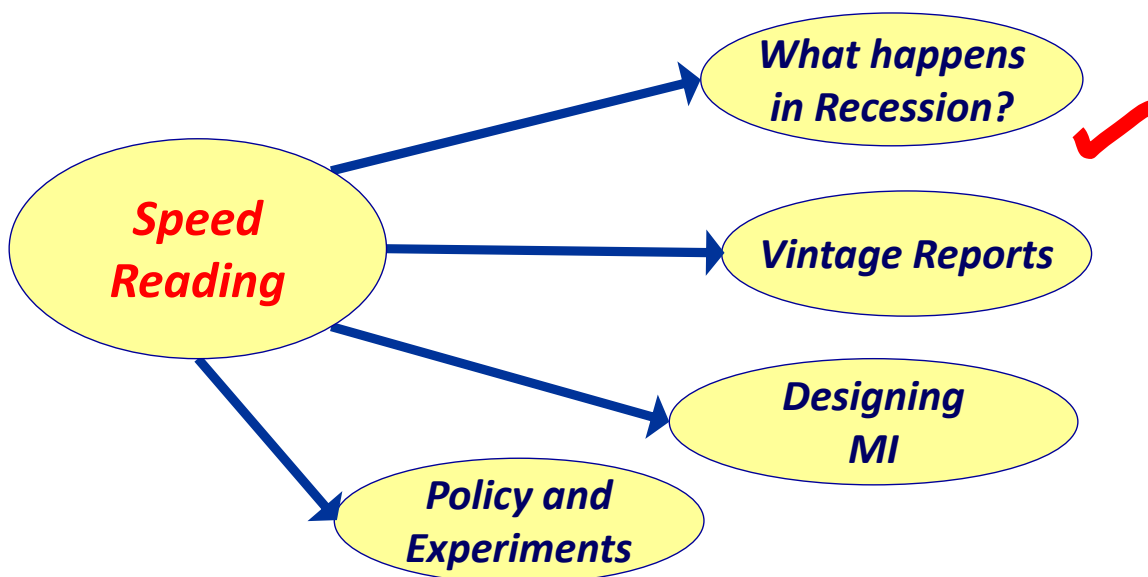
INFORMATION
- analytic
- complete

CONTROL
- centralised
- communication

EFFICIENT
- low cost delivery
- open to change

**R
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Speed Reading: Structure of Presentation



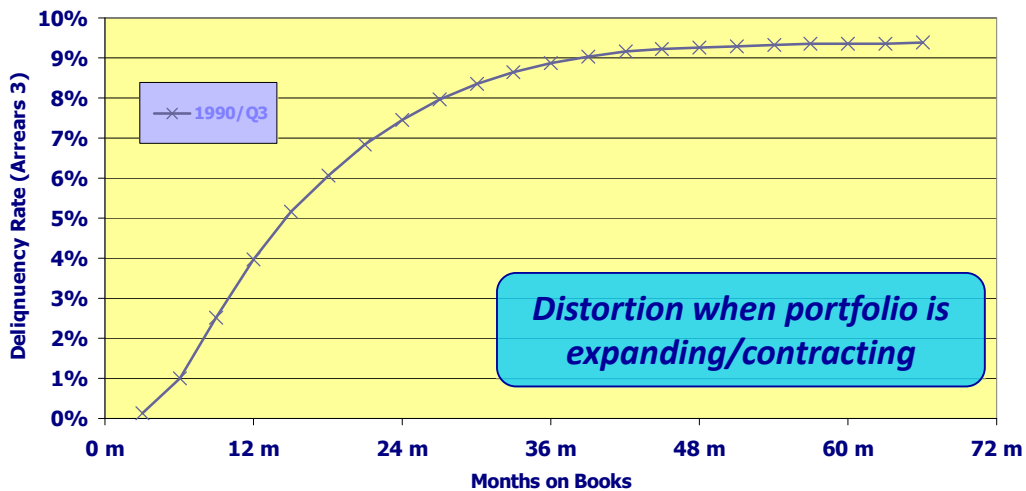
Using portfolio tracking in a recession

Actual Vintage Matrix: UK Recession 1990

| Opening Quarter | A/C Open | From to | 0 m - 3 m | 3 m - 6 m | 6 m - 9 m | 9 m - 12 m | 12 m - 15 m | 15 m - 18 m | 18 m - 21 m | 21 m - 24 m | 24 m - 27 m | 27 m - 30 m | 30 m - 33 m | 33 m - 36 m | 36 m - 39 m | 39 m - 42 m | 42 m - 45 m | 45 m - 48 m |
|-----------------|----------|---------|-----------|-----------|-----------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1989/Q4 | 34841 | | 0.1% | 0.1% | 1.6% | 2.7% | 3.6% | 4.2% | 4.5% | 5.6% | 6.1% | 6.9% | 7.2% | 7.4% | 7.6% | 7.8% | 7.9% | 7.9% |
| 1990/Q1 | 35677 | | 0.0% | 0.7% | 1.8% | 3.1% | 4.3% | 5.3% | 6.1% | 6.7% | 7.4% | 7.8% | 8.1% | 8.4% | 8.6% | 8.7% | 8.8% | 8.9% |
| 1990/Q2 | 36614 | | 0.1% | 0.9% | 2.2% | 3.7% | 4.9% | 6.0% | 6.8% | 7.5% | 8.0% | 8.5% | 8.8% | 9.0% | 9.2% | 9.4% | 9.4% | 9.5% |
| 1990/Q3 | 36436 | | 0.1% | 1.0% | 2.5% | 4.0% | 5.2% | 6.1% | 6.8% | 7.5% | 8.0% | 8.4% | 8.7% | 8.9% | 9.0% | 9.2% | 9.2% | 9.3% |
| 1990/Q4 | 38157 | | 0.1% | 1.2% | 2.6% | 4.1% | 5.3% | 6.4% | 7.1% | 7.8% | 8.3% | 8.7% | 9.0% | 9.2% | 9.4% | 9.5% | 9.5% | 9.6% |
| 1991/Q1 | 38661 | | 0.1% | 1.0% | 2.4% | 3.8% | 5.0% | 5.9% | 6.7% | 7.3% | 7.8% | 8.2% | 8.5% | 8.7% | 8.8% | 8.9% | 8.9% | 9.0% |
| 1991/Q2 | 40624 | | 0.1% | 0.9% | 2.2% | 3.5% | 4.5% | 5.3% | 6.0% | 6.7% | 7.1% | 7.4% | 7.7% | 7.8% | 7.9% | 8.0% | 8.1% | 8.1% |
| 1991/Q3 | 42872 | | 0.1% | 0.9% | 2.1% | 3.2% | 4.2% | 5.0% | 5.7% | 6.2% | 6.6% | 6.9% | 7.1% | 7.2% | 7.3% | 7.4% | 7.5% | 7.5% |
| 1991/Q4 | 44150 | | 0.1% | 0.8% | 1.9% | 2.9% | 3.9% | 4.7% | 5.3% | 5.7% | 6.1% | 6.3% | 6.4% | 6.6% | 6.7% | 6.7% | 6.8% | 6.9% |
| 1992/Q1 | 45330 | | 0.1% | 0.8% | 1.7% | 2.8% | 3.8% | 4.4% | 5.0% | 5.5% | 5.8% | 6.0% | 6.1% | 6.3% | 6.4% | 6.5% | 6.5% | 6.6% |
| 1992/Q2 | 47769 | | 0.1% | 0.8% | 1.8% | 2.9% | 3.7% | 4.3% | 4.8% | 5.2% | 5.4% | 5.6% | 5.8% | 5.9% | 6.0% | 6.1% | 6.1% | 6.1% |
| 1992/Q3 | 48587 | | 0.1% | 0.8% | 1.8% | 2.6% | 3.4% | 4.0% | 4.4% | 4.7% | 5.0% | 5.2% | 5.3% | 5.4% | 5.5% | 5.6% | | |
| 1992/Q4 | 49334 | | 0.1% | 0.8% | 1.7% | 2.6% | 3.3% | 3.9% | 4.1% | 4.6% | 4.8% | 5.0% | 5.2% | 5.3% | 5.4% | | | |
| 1993/Q1 | 51777 | | 0.1% | 0.7% | 1.6% | 2.4% | 3.0% | 3.6% | 3.9% | 4.2% | 4.4% | 4.6% | 4.8% | 4.9% | | | | |
| 1993/Q2 | 53932 | | 0.1% | 0.7% | 1.5% | 2.2% | 2.7% | 3.2% | 3.6% | 3.9% | 4.1% | 4.3% | 4.5% | | | | | |
| 1993/Q3 | 55600 | | 0.1% | 0.7% | 1.5% | 2.1% | 2.6% | 3.0% | 3.4% | 3.7% | 3.9% | 4.2% | | | | | | |
| 1993/Q4 | 56840 | | 0.1% | 0.7% | 1.4% | 2.2% | 2.7% | 3.2% | 3.5% | 3.9% | 4.2% | | | | | | | |
| 1994/Q1 | 58353 | | 0.1% | 0.6% | 1.4% | 2.2% | 2.8% | 3.3% | 3.8% | 4.2% | | | | | | | | |
| 1994/Q2 | 61242 | | 0.1% | 0.7% | 1.5% | 2.2% | 3.0% | 3.6% | 4.0% | | | | | | | | | |
| 1994/Q3 | 62591 | | 0.1% | 0.7% | 1.6% | 2.4% | 3.1% | 3.6% | | | | | | | | | | |
| 1994/Q4 | 64363 | | 0.1% | 0.8% | 1.7% | 2.7% | 3.5% | | | | | | | | | | | |
| 1995/Q1 | 66421 | | 0.1% | 0.8% | 1.8% | 2.8% | | | | | | | | | | | | |
| 1995/Q2 | 71447 | | 0.1% | 0.7% | 1.7% | | | | | | | | | | | | | |
| 1995/Q3 | 74309 | | 0.1% | 0.9% | | | | | | | | | | | | | | |
| 1995/Q4 | 76460 | | 0.1% | | | | | | | | | | | | | | | |

Overview of portfolio development

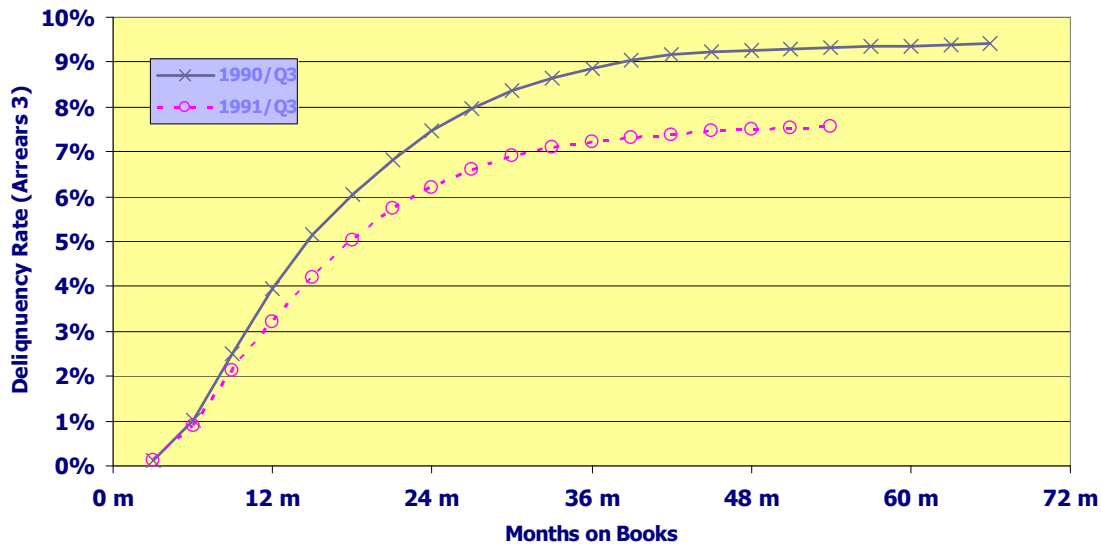
Lifecycle Effect



Dominant effect in delinquency

New Account Effect

Graphical representation



How soon can you spot the difference?



New Account Effect:

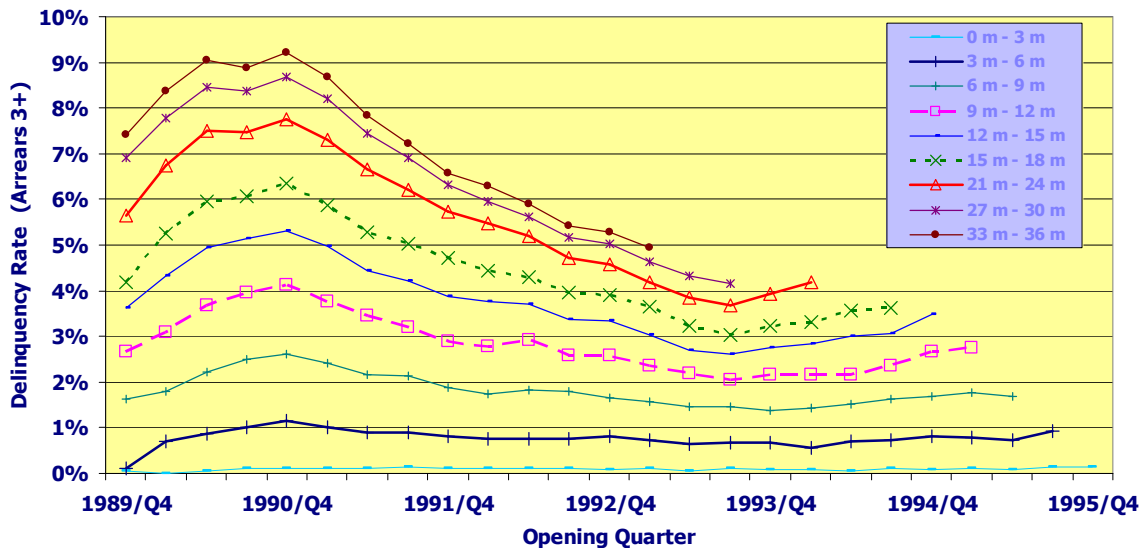
Row comparison

| Opening Quarter | A/C open | From to | 0 m - 3 m | 3 m - 6 m | 6 m - 9 m | 9 m - 12 m | 12 m - 15 m | 15 m - 18 m | 18 m - 21 m | 21 m - 24 m | 24 m - 27 m | 27 m - 30 m | 30 m - 33 m | 33 m - 36 m | 36 m - 39 m | 39 m - 42 m | 42 m - 45 m |
|-----------------|----------|---------|-----------|-----------|-----------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1989/Q4 | 34841 | | 0.07% | 0.11% | 1.6% | 2.7% | 3.6% | 4.2% | 4.5% | 5.6% | 6.1% | 6.9% | 7.2% | 7.4% | 7.6% | 7.8% | 7.9% |
| 1990/Q1 | 35677 | | 0.00% | 0.70% | 1.8% | 3.1% | 4.3% | 5.3% | 6.1% | 6.7% | 7.4% | 7.8% | 8.1% | 8.4% | 8.6% | 8.7% | 8.8% |
| 1990/Q2 | 36614 | | 0.07% | 0.88% | 2.2% | 3.7% | 4.9% | 6.0% | 6.8% | 7.5% | 8.0% | 8.5% | 8.8% | 9.0% | 9.2% | 9.4% | 9.4% |
| 1990/Q3 | 36436 | | 0.12% | 1.01% | 2.5% | 4.0% | 5.2% | 6.1% | 6.8% | 7.5% | 8.0% | 8.4% | 8.7% | 8.9% | 9.0% | 9.2% | 9.2% |
| 1990/Q4 | 38157 | | 0.11% | 1.15% | 2.6% | 4.1% | 5.3% | 6.4% | 7.1% | 7.8% | 8.3% | 8.7% | 9.0% | 9.2% | 9.4% | 9.5% | 9.5% |
| 1991/Q1 | 38661 | | 0.12% | 1.00% | 2.4% | 3.8% | 5.0% | 5.9% | 6.7% | 7.3% | 7.8% | 8.2% | 8.5% | 8.7% | 8.8% | 8.9% | 8.9% |
| 1991/Q2 | 40624 | | 0.12% | 0.89% | 2.2% | 3.5% | 4.5% | 5.3% | 6.0% | 6.7% | 7.1% | 7.4% | 7.7% | 7.8% | 7.9% | 8.0% | 8.1% |
| 1991/Q3 | 42872 | | 0.13% | 0.89% | 2.1% | 3.2% | 4.2% | 5.0% | 5.7% | 6.2% | 6.6% | 6.9% | 7.1% | 7.2% | 7.3% | 7.4% | 7.5% |
| 1991/Q4 | 44150 | | 0.10% | 0.82% | 1.9% | 2.9% | 3.9% | 4.7% | 5.3% | 5.7% | 6.1% | 6.3% | 6.4% | 6.6% | 6.7% | 6.7% | 6.8% |
| 1992/Q1 | 45330 | | 0.11% | 0.77% | 1.7% | 2.8% | 3.8% | 4.4% | 5.0% | 5.5% | 5.8% | 6.0% | 6.1% | 6.3% | 6.4% | 6.5% | 6.5% |
| 1992/Q2 | 47769 | | 0.10% | 0.75% | 1.8% | 2.9% | 3.7% | 4.3% | 4.8% | 5.2% | 5.4% | 5.6% | 5.8% | 5.9% | 6.0% | 6.1% | 6.1% |
| 1992/Q3 | 48587 | | 0.10% | 0.75% | 1.8% | 2.6% | 3.4% | 4.0% | 4.4% | 4.7% | 5.0% | 5.2% | 5.3% | 5.4% | 5.5% | 5.6% | |
| 1992/Q4 | 49334 | | 0.09% | 0.81% | 1.7% | 2.6% | 3.3% | 3.9% | 4.1% | 4.6% | 4.8% | 5.0% | 5.2% | 5.3% | 5.4% | | |
| 1993/Q1 | 51777 | | 0.10% | 0.72% | 1.6% | 2.4% | 3.0% | 3.6% | 3.9% | 4.2% | 4.4% | 4.6% | 4.8% | 4.9% | | | |
| 1993/Q2 | 53932 | | 0.07% | 0.65% | 1.5% | 2.2% | 2.7% | 3.2% | 3.6% | 3.9% | 4.1% | 4.3% | 4.5% | | | | |
| 1993/Q3 | 55600 | | 0.10% | 0.67% | 1.5% | 2.1% | 2.6% | 3.0% | 3.4% | 3.7% | 3.9% | 4.2% | | | | | |
| 1993/Q4 | 56840 | | 0.08% | 0.67% | 1.4% | 2.2% | 2.7% | 3.2% | 3.5% | 3.9% | 4.2% | | | | | | |
| 1994/Q1 | 58353 | | 0.08% | 0.57% | 1.4% | 2.2% | 2.8% | 3.3% | 3.8% | 4.2% | | | | | | | |
| 1994/Q2 | 61242 | | 0.07% | 0.70% | 1.5% | 2.2% | 3.0% | 3.6% | 4.0% | | | | | | | | |
| 1994/Q3 | 62591 | | 0.11% | 0.73% | 1.6% | 2.4% | 3.1% | 3.6% | | | | | | | | | |
| 1994/Q4 | 64363 | | 0.09% | 0.81% | 1.7% | 2.7% | 3.5% | | | | | | | | | | |
| 1995/Q1 | 66421 | | 0.12% | 0.78% | 1.8% | 2.8% | | | | | | | | | | | |
| 1995/Q2 | 71447 | | 0.09% | 0.74% | 1.7% | | | | | | | | | | | | |
| 1995/Q3 | 74309 | | 0.13% | 0.93% | | | | | | | | | | | | | |
| 1995/Q4 | 76460 | | 0.13% | | | | | | | | | | | | | | |

Change in recruitment: product, marketing, underwriting



Vintage Graph: Cohort representation



Hides lifecycle effect – highlights new account effects

Vintage Matrix Specifications

- Frequency: Monthly
 - Establish more detailed patterns than quarterly
- Bad Definition: Currently Arrears 2+
 - not “maximum delinquency” or Basel definitions
 - see improving trends faster
- Denominator: Accounts opened
 - Same across row – avoid distortions with closed accounts
- Rows: Open month x product type
 - E.g. Loan Purpose: Debt Consolidation, New Lending

**Design to get fastest, clearest feedback
KEY FOR MANAGEMENT DIRECTION**

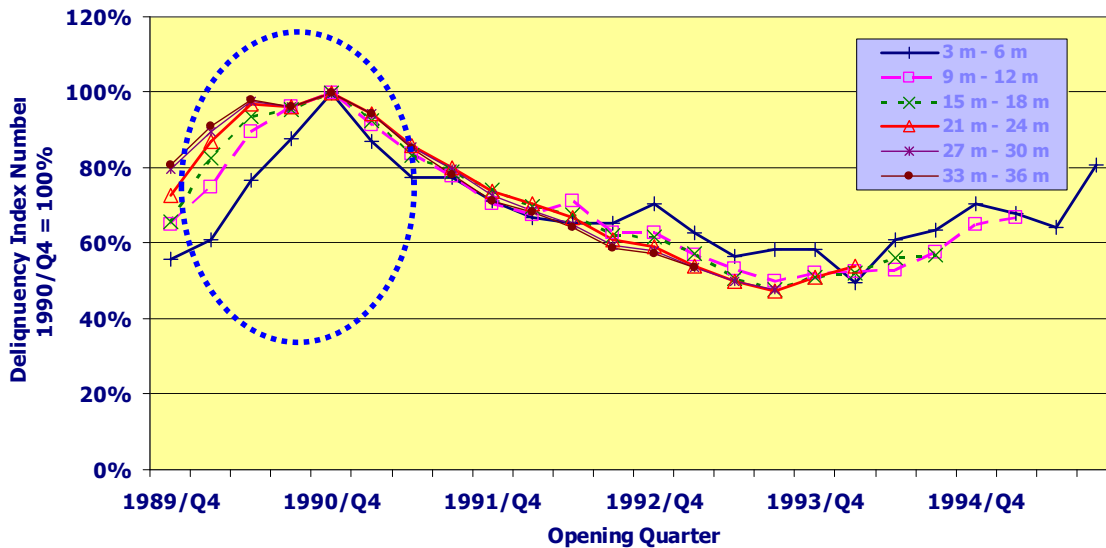
Vintage Index Matrix: Allows early comparisons

| Opening Quarter | A/C open | From to | 0 m - 3 m | 3 m - 6 m | 6 m - 9 m | 9 m - 12 m | 12 m - 15 m | 15 m - 18 m | 18 m - 21 m | 21 m - 24 m | 24 m - 27 m | 27 m - 30 m | 30 m - 33 m | 33 m - 36 m | 36 m - 39 m | 39 m - 42 m | 42 m - 45 m |
|-----------------|----------|---------|-----------|-----------|-----------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Standard | 1990/Q4 | | 0.1% | 1.2% | 2.6% | 4.1% | 5.3% | 6.4% | 7.1% | 7.8% | 8.3% | 8.7% | 9.0% | 9.2% | 9.4% | 9.5% | 9.5% |
| 1989/Q4 | 34841 | | 64% | 56% | 63% | 65% | 68% | 66% | 63% | 73% | 73% | 79% | 80% | 81% | 81% | 82% | 83% |
| 1990/Q1 | 35677 | | 64% | 61% | 69% | 75% | 81% | 83% | 86% | 87% | 89% | 90% | 90% | 91% | 91% | 92% | 93% |
| 1990/Q2 | 36614 | | 64% | 77% | 85% | 90% | 93% | 94% | 95% | 97% | 97% | 97% | 98% | 98% | 99% | 99% | 99% |
| 1990/Q3 | 36436 | | 109% | 88% | 96% | 96% | 97% | 95% | 96% | 96% | 96% | 96% | 96% | 96% | 96% | 97% | 97% |
| 1990/Q4 | 38157 | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| 1991/Q1 | 38661 | | 109% | 87% | 93% | 91% | 94% | 92% | 94% | 94% | 94% | 94% | 94% | 94% | 94% | 93% | 94% |
| 1991/Q2 | 40624 | | 109% | 77% | 83% | 84% | 84% | 83% | 85% | 86% | 85% | 86% | 85% | 85% | 85% | 85% | 85% |
| 1991/Q3 | 42872 | | 118% | 77% | 82% | 78% | 79% | 79% | 80% | 80% | 79% | 79% | 79% | 78% | 78% | 78% | 79% |
| 1991/Q4 | 44150 | | 91% | 71% | 72% | 70% | 73% | 74% | 74% | 74% | 73% | 73% | 72% | 71% | 71% | 71% | 72% |
| 1992/Q1 | 45330 | | 100% | 67% | 67% | 67% | 71% | 70% | 70% | 71% | 70% | 69% | 68% | 68% | 68% | 68% | 69% |
| 1992/Q2 | 47769 | | 91% | 65% | 70% | 71% | 70% | 68% | 67% | 67% | 65% | 65% | 64% | 64% | 64% | 64% | 65% |
| 1992/Q3 | 48587 | | 91% | 65% | 69% | 63% | 63% | 62% | 62% | 61% | 60% | 59% | 59% | 59% | 59% | 59% | 59% |
| 1992/Q4 | 49334 | | 82% | 70% | 64% | 63% | 63% | 61% | 57% | 59% | 58% | 58% | 58% | 57% | 58% | 58% | 59% |
| 1993/Q1 | 51777 | | 91% | 63% | 60% | 57% | 57% | 57% | 54% | 54% | 53% | 53% | 54% | 54% | 54% | 54% | 54% |
| 1993/Q2 | 53932 | | 64% | 57% | 56% | 53% | 51% | 51% | 50% | 50% | 49% | 50% | 50% | 50% | 50% | 50% | 50% |
| 1993/Q3 | 55600 | | 91% | 58% | 56% | 50% | 49% | 48% | 48% | 47% | 47% | 48% | 48% | 48% | 48% | 48% | 48% |
| 1993/Q4 | 56840 | | 73% | 58% | 53% | 52% | 52% | 51% | 49% | 51% | 51% | 51% | 51% | 51% | 51% | 51% | 51% |
| 1994/Q1 | 58353 | | 73% | 50% | 54% | 52% | 53% | 52% | 53% | 54% | 54% | 54% | 54% | 54% | 54% | 54% | 54% |
| 1994/Q2 | 61242 | | 64% | 61% | 58% | 53% | 56% | 56% | 57% | 57% | 57% | 57% | 57% | 57% | 57% | 57% | 57% |
| 1994/Q3 | 62591 | | 100% | 63% | 62% | 58% | 58% | 57% | 57% | 57% | 57% | 57% | 57% | 57% | 57% | 57% | 57% |
| 1994/Q4 | 64363 | | 82% | 70% | 65% | 65% | 66% | 66% | 66% | 66% | 66% | 66% | 66% | 66% | 66% | 66% | 66% |
| 1995/Q1 | 66421 | | 109% | 68% | 67% | 67% | 67% | 67% | 67% | 67% | 67% | 67% | 67% | 67% | 67% | 67% | 67% |
| 1995/Q2 | 71447 | | 82% | 64% | 65% | 65% | 65% | 65% | 65% | 65% | 65% | 65% | 65% | 65% | 65% | 65% | 65% |
| 1995/Q3 | 74309 | | 118% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% |
| 1995/Q4 | 76460 | | 118% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% | 81% |

Index number: delinquency rate in cell
rate in reference period (with same exposure)
 e.g. 1990/Q3, 10 - 12 m exposure: $4.0\%/4.1\% = .96$



Vintage Index Graph: Shows portfolio effects



Portfolio effect: convergence/divergence of indices



Portfolio Effect – onset of recession

Diagonal term

| Opening Quarter | A/C open | From to | 0 m - 3 m | 3 m - 6 m | 6 m - 9 m | 9 m - 12 m | 12 m - 15 m | 15 m - 18 m | 18 m - 21 m | 21 m - 24 m | 24 m - 27 m |
|-----------------|----------|---------|-----------|-----------|-----------|------------|-------------|-------------|-------------|-------------|-------------|
| Standard | | | 0.1% | 1.2% | 2.6% | 4.1% | 5.3% | 6.4% | 7.1% | 7.8% | 8.3% |
| 1989/Q4 | 34841 | | 64% | 56% | 63% | 65% | 68% | 66% | 63% | 73% | 73% |
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| 1990/Q2 | 36614 | | 64% | 77% | 85% | 90% | 93% | 94% | 95% | 97% | 97% |
| 1990/Q3 | 36436 | | 109% | 88% | 96% | 96% | 97% | 95% | 96% | 96% | 96% |
| 1990/Q4 | 38157 | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| 1991/Q1 | 38661 | | 109% | 87% | 93% | 91% | 94% | 92% | 94% | 94% | 94% |
| 1991/Q2 | 40624 | | 109% | 77% | 83% | 84% | 84% | 83% | 85% | 86% | 85% |
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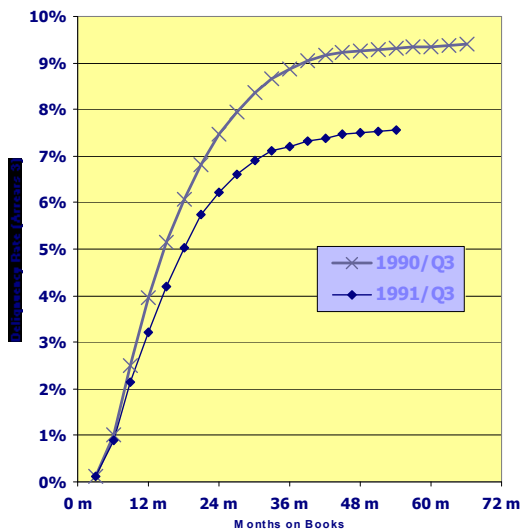
- Change in shape of lifecycle curve
- Vintage starts on one trajectory, moves to another
- Corresponds to change on observation date (diagonal)
- Due to economy, collections system,

Most difficult to spot – key in recession

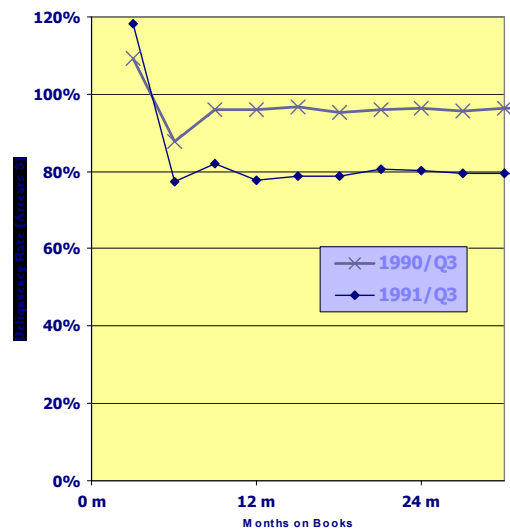
Timely Policy Modification

Index numbers give better focus

Lifecycle Curves



Index Numbers

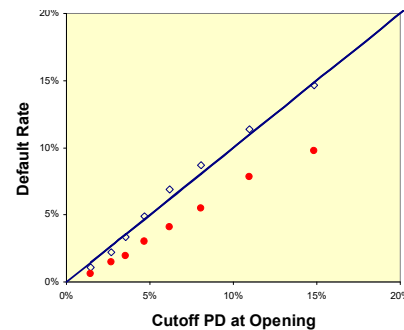
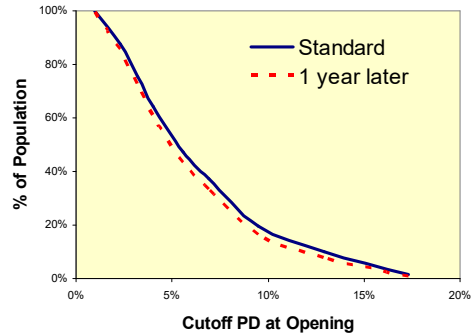


Faster Response -> Competitive Edge

Exit from Recession

Spot green shoots

- Recession duration
 - Example portfolio: 9 mos
 - 2 years on economic statistics
 - Consumer credit leads economy
- 1st sign: improvement in applicant profile
 - K-S = 4%
 - Average PD 6.4% -> 6%
- 2nd sign: default rates < PDs
 - Default Rate = 3.8%
- Collections: reacts more slowly
- Recoveries slower still



Leading Indicator: Population PD

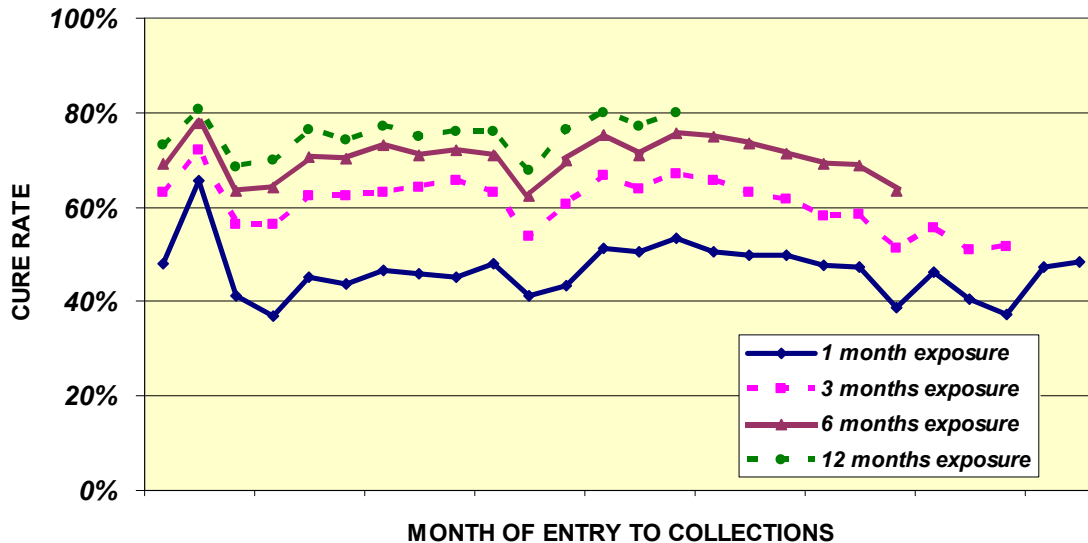
Vintage matrix applications

- Account openings
 - By open date and time on books:
 - Delinquency
 - Average balance
 - Cross-selling
 - Attrition
- Collections
 - By date entered collections
 - Outcome in weeks
 - Cure rate
 - Balance growth
 - Transfers to recovery
- Recoveries
 - By date entered
 - Cash recovered

Management must be able to explain fluctuations
Group reporting tool

Collections Cure rates

Key performance indicator



Differences in performance visible 3-4 weeks after entry

Default Rate/Average PD at opening

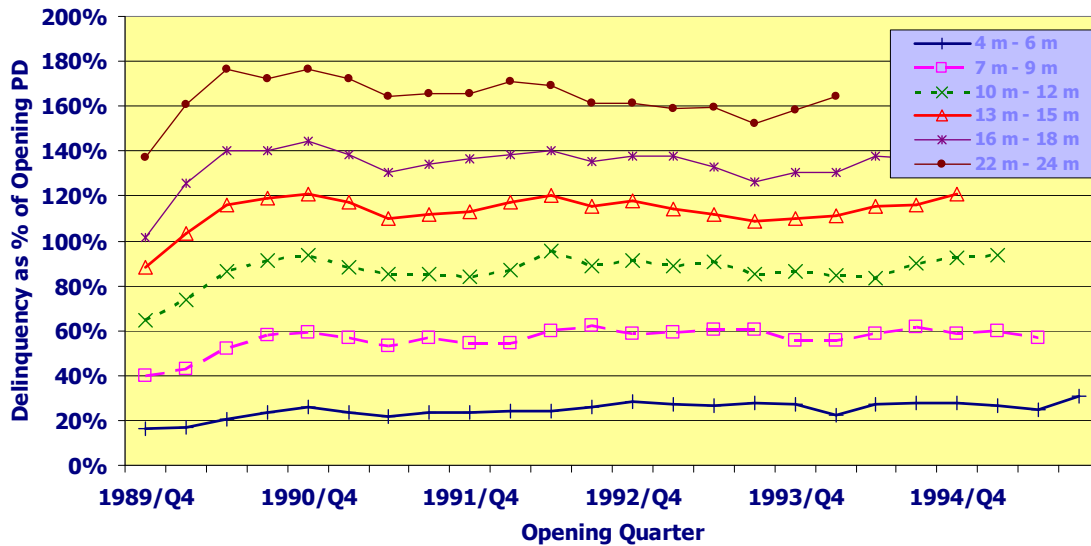
Understand departures from expectations

| Opening Quarter | Avg. PD at opening | From to | 0 m - 3 m | 3 m - 6 m | 6 m - 9 m | 9 m - 12 m | 12 m - 15 m | 15 m - 18 m | 18 m - 21 m | 21 m - 24 m | 24 m - 27 m | 27 m - 30 m | 30 m - 33 m | 33 m - 36 m | 36 m - 39 m | 39 m - 42 m | 42 m - 45 m |
|-----------------|--------------------|---------|-----------|-----------|-----------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1989/Q4 | 4.1% | | 2% | 17% | 40% | 65% | 88% | 101% | 109% | 137% | 148% | 167% | 174% | 180% | 184% | 189% | 191% |
| 1990/Q1 | 4.2% | | 2% | 17% | 43% | 74% | 103% | 126% | 146% | 161% | 177% | 186% | 193% | 200% | 204% | 208% | 210% |
| 1990/Q2 | 4.3% | | 2% | 21% | 52% | 87% | 116% | 140% | 159% | 176% | 188% | 199% | 207% | 212% | 216% | 220% | 222% |
| 1990/Q3 | 4.3% | | 3% | 23% | 58% | 91% | 119% | 140% | 158% | 172% | 184% | 193% | 200% | 205% | 209% | 212% | 213% |
| 1990/Q4 | 4.4% | | 3% | 26% | 59% | 94% | 121% | 145% | 162% | 176% | 189% | 197% | 204% | 209% | 213% | 215% | 216% |
| 1991/Q1 | 4.3% | | 3% | 24% | 57% | 88% | 117% | 138% | 157% | 172% | 184% | 193% | 199% | 204% | 207% | 208% | 209% |
| 1991/Q2 | 4.1% | | 3% | 22% | 53% | 85% | 110% | 131% | 149% | 164% | 175% | 183% | 189% | 194% | 196% | 198% | 199% |
| 1991/Q3 | 3.8% | | 3% | 24% | 57% | 85% | 112% | 134% | 153% | 166% | 176% | 184% | 189% | 192% | 195% | 197% | 199% |
| 1991/Q4 | 3.5% | | 3% | 24% | 54% | 84% | 113% | 137% | 153% | 166% | 176% | 183% | 187% | 190% | 193% | 195% | 198% |
| 1992/Q1 | 3.2% | | 3% | 24% | 54% | 87% | 118% | 138% | 157% | 171% | 182% | 186% | 192% | 196% | 199% | 202% | 203% |
| 1992/Q2 | 3.1% | | 3% | 24% | 60% | 95% | 121% | 140% | 156% | 169% | 177% | 183% | 189% | 193% | 196% | 198% | 200% |
| 1992/Q3 | 2.9% | | 3% | 26% | 62% | 89% | 115% | 135% | 152% | 161% | 170% | 177% | 182% | 186% | 190% | 193% | |
| 1992/Q4 | 2.8% | | 3% | 29% | 58% | 91% | 118% | 138% | 144% | 161% | 169% | 177% | 182% | 186% | 190% | | |
| 1993/Q1 | 2.6% | | 4% | 27% | 59% | 89% | 114% | 138% | 146% | 159% | 168% | 176% | 182% | 187% | | | |
| 1993/Q2 | 2.4% | | 3% | 27% | 60% | 90% | 112% | 133% | 147% | 160% | 169% | 179% | 186% | | | | |
| 1993/Q3 | 2.4% | | 4% | 28% | 60% | 85% | 109% | 126% | 141% | 152% | 163% | 172% | | | | | |
| 1993/Q4 | 2.5% | | 3% | 27% | 55% | 86% | 110% | 130% | 140% | 158% | 170% | | | | | | |
| 1994/Q1 | 2.5% | | 3% | 22% | 56% | 85% | 111% | 130% | 148% | 164% | | | | | | | |
| 1994/Q2 | 2.6% | | 3% | 27% | 59% | 84% | 115% | 138% | 155% | | | | | | | | |
| 1994/Q3 | 2.6% | | 4% | 28% | 62% | 90% | 116% | 137% | | | | | | | | | |
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| 1995/Q1 | 2.9% | | 4% | 27% | 60% | 94% | | | | | | | | | | | |
| 1995/Q2 | 3.0% | | 3% | 25% | 57% | | | | | | | | | | | | |
| 1995/Q3 | 3.0% | | 4% | 31% | | | | | | | | | | | | | |
| 1995/Q4 | 3.0% | | 4% | | | | | | | | | | | | | | |

Explains most new account effects – e.g. scorecard cut-off

Vintage relative to PD

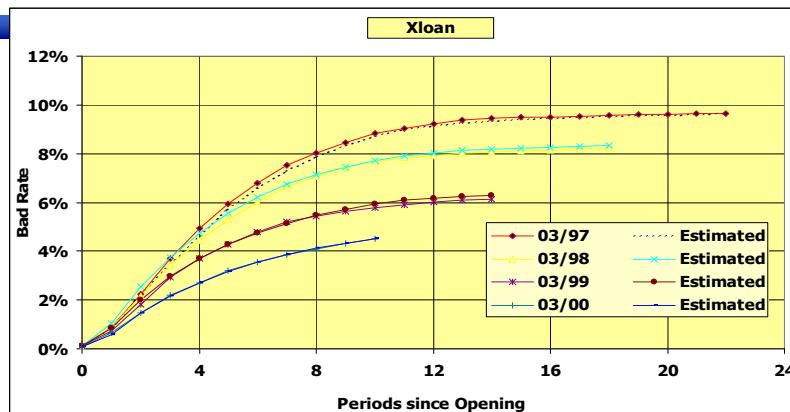
Actual vs. Expected



**Concentrates on incremental information –
What is not in the budget?**

Vintage Matrix Projections

Key budgeting tool



- “Fill in lower half of vintage matrix”
- Regression time series techniques
 - Scoreplus course “Financial Portfolio Modelling”
- Formalizes the monitoring of the budget
- Facilitates stress test

Portfolio tracking <-> Portfolio Budget

Vintage Matrix Summary

Design Principles

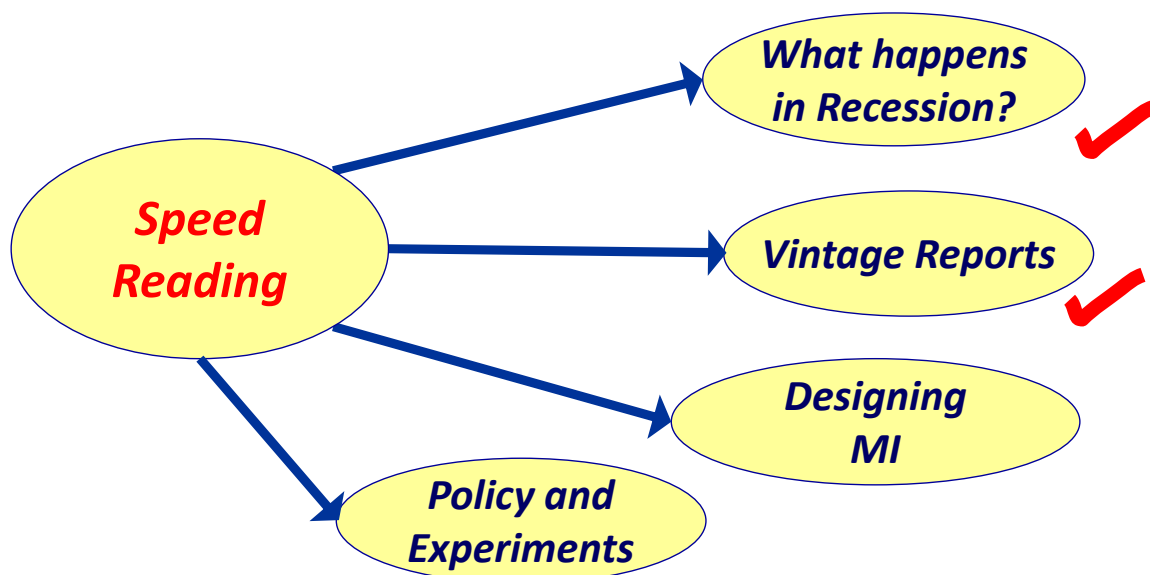
- Key structures
 - Lifecycle Effect
 - New Account Effect
 - Portfolio Effect
- Frequency: monthly
- Express default rate as % of average PD
- Vintage graph to track outcomes
 - Not lifecycle graph

Best Practice Use

- Discussed at monthly credit committee
- Used for review with Group
- Commentary required on all new account and portfolio effects
- Major changes can be spotted ~4 months after happening
- Leading indicator in recession
 - on entry
 - on exit

Key report for executive management of portfolios

Speed Reading: Structure of Presentation



Using portfolio tracking in a recession

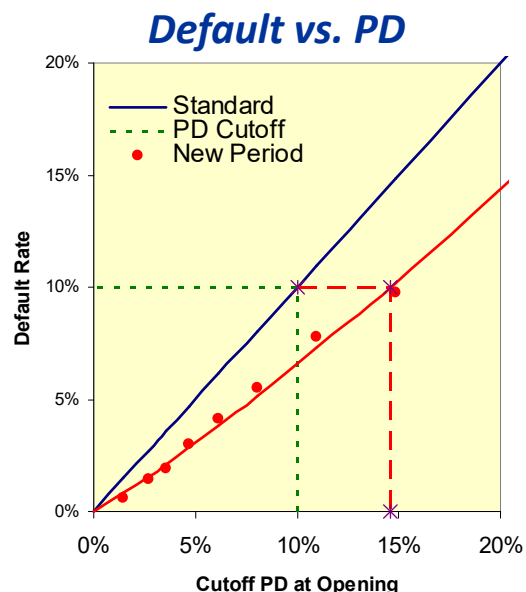
Tracking Principles

- Actual vs. Expected
 - Match outcome vs. assumptions underlying policy
 - Assumptions correspond to budget
- Report Early (... and Often)
 - Timely policy modification
 - Speed of change is key to competitive positioning
 - Most changes can be identified within 4 months of occurrence
- Understand Portfolio
 - Develop conceptual picture of dynamics of portfolio
- Evaluate policies
 - not just scorecards
- Reliability of Rating Tools
 - Can we believe the numbers?
 - Relevant information missing?
- Regulatory Requirements
 - By-product of good management practice

Tracking → Learning → Change

Actual vs. Expected Principle *Fundamental to policy management*

- Policy is based on assumptions
- Are assumptions met?
 - Policy Environment
 - Policy Application
 - Subsequent Performance
- Are consequences what we expected?
- Adjust assumptions
 - e.g. PD-Default Rate relationship
- ⇒ Change in policy
 - e.g. Acceptance cut-off
- Set expectations for future



Tracking must be used to be useful ...

Goal: Accelerate Policy Evolution

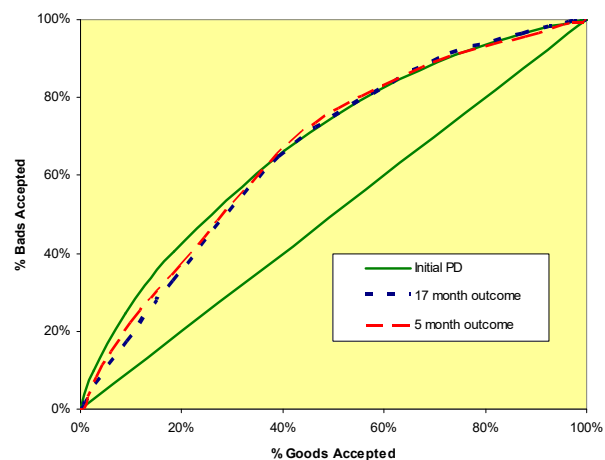
- Example: Timeline from new lending policy
 - Jan 2007 - Loan solicitation policy for credit card holders
 - Mar 2007 - Response rate
 - Mar 2007 - Population profile
 - Jun 2007 - Balance Levels
 - Jun 2007 - Early delinquency
 - Jan 2008 - Revenue
 - Jun 2008 - Full delinquency
 - Dec 2008 - Attrition
 - Dec 2009 - Secured Loan Cross-sell
- 3 year full evaluation
 - But get intermediate feedback

Can credit risk move as fast as marketing?

Early Outcome Measurement Example: Gini Coefficient

- Recession data
 - Accepts only – ignore rejects
- Strategy based on Gini = 36%
- Actual Gini at 17 m. = 32%
 - Based on 827 bads
- Significant deterioration in scorecard
 - Requires change in strategy
- Gini at 5 m. = 33%
 - Based on 136 bads
- Modify limit policy?
- Important features emerge fast

Gini on Accepts



Faster reaction -> More appropriate policies -> More profit

Portfolio Risk Overview

Do strategies meet profit goals?

| STRATEGY NODE | BREAKDOWN OF BOOK | | | | | RISK ANALYSIS | | | | PROFITABILITY ANALYSIS | | | | | | |
|-------------------------|-------------------|-----------|----------------|---------------|-----------------|---------------|------------------------|-------------------|---------------------------|------------------------|---------------------|------------------------|-----------------|-----------------------|------------------|---------|
| | Cases | % of Book | Total Balances | % of Exposure | Average Balance | Average PD | Expected Loss/ Balance | Expected Loss (€) | Economic Capital/ Balance | Margin/ Account | Fee Income/ Account | Total Revenue/ Account | Profit/ Account | Net Revenue/ EL Ratio | Return on Assets | RAROC |
| | Actual | Budget | Variance | Actual | Budget | Variance | Actual | Budget | Variance | Actual | Budget | Variance | Actual | Budget | Variance | Actual |
| Strategy Exclusions | 3417 | 1.64% | €10,992k | 1.25% | €3,217.00 | 16.5% | 12.7% | €1,392k | 13.2% | 8.04% | € 35.32 | € 293.92 | € 158.76 | 61% | -4.93% | -37.32% |
| Low Risk, High Usage | 9519 | 4.56% | €57,885k | 6.59% | €6,081.00 | 3.2% | 2.4% | €1,404k | 9.1% | 7.10% | € 25.01 | € 456.54 | € 270.04 | 283% | 4.44% | 48.74% |
| Low Risk, Medium usage | 23139 | 11.09% | €97,207k | 11.06% | €4,201.00 | 2.3% | 1.8% | €1,729k | 8.4% | 7.96% | € 20.43 | € 354.83 | € 243.84 | 426% | 5.80% | 68.98% |
| Low Risk, Low usage | 26315 | 12.61% | €36,288k | 4.13% | €1,379.00 | 1.8% | 1.3% | €489k | 7.7% | 8.74% | € 13.75 | € 134.34 | € 83.51 | 549% | 6.06% | 78.20% |
| Medium Risk, high usage | 22717 | 10.88% | €157,588k | 17.93% | €6,937.00 | 5.7% | 4.4% | €6,965k | 9.7% | 8.93% | € 30.57 | € 650.27 | € 301.33 | 198% | 4.34% | 44.64% |
| Accounts in Default | 8915 | 4.27% | €55,407k | 6.31% | €6,215.00 | 100.0% | 70.3% | €38,951k | 0.0% | 5.60% | € 67.16 | € 415.50 | € 4,017.94 | 8% | -64.65% | 0.00% |
| TOTAL BOOK | 208721 | 100.00% | €878,679k | 100.00% | €4,209.82 | 9.6% | 9.1% | €79,659k | 9.2% | 7.30% | € 26.13 | € 333.36 | € 87.97 | 77% | -2.09% | -22.61% |

- Analyse return by strategy
 - Concentrate on marginal cases
- Reconcile to portfolio budget
 - Concentrate on financials
- Strategy trades-off risk and reward
 - Keep strategies simple
 - <= 20 nodes!

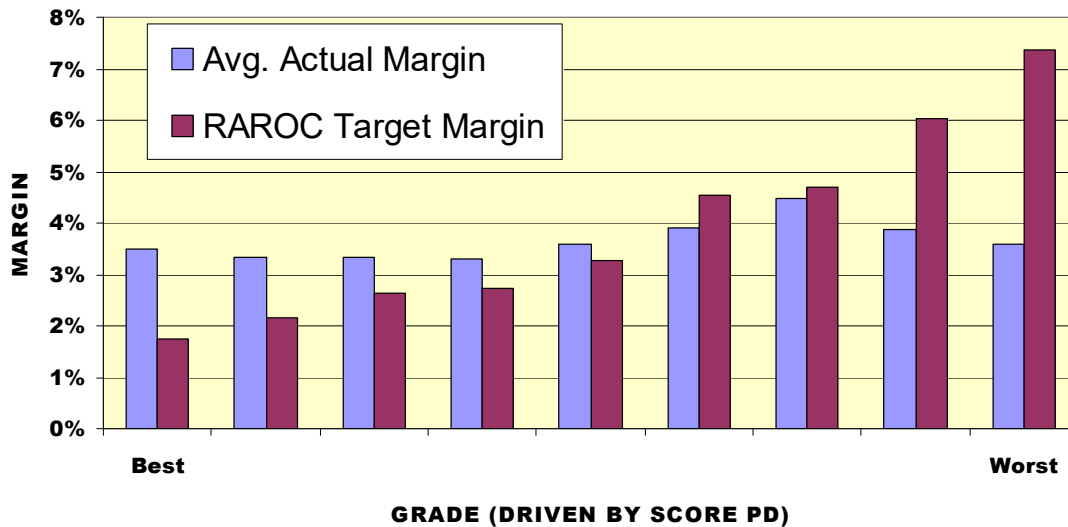
Conference paper: Speed Reading © Scoreplus SARRL 2009

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Example: Network Pricing Behaviour

Branch small business portfolio



Use tracking to understand portfolio drivers

Conference paper: Speed Reading © Scoreplus SARRL 2009

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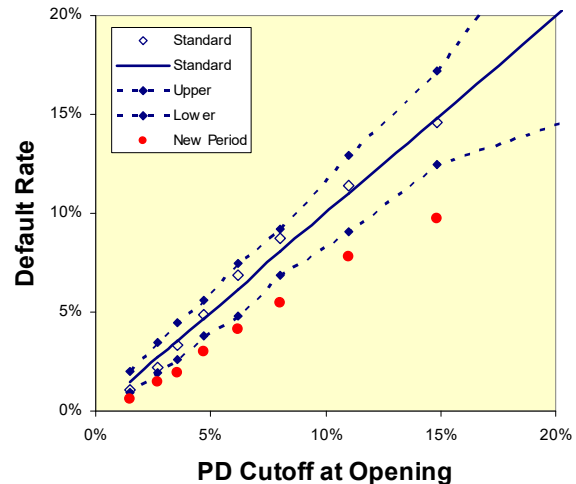


Statistical Tests

Why? What?

- Fast results = small samples
- Small samples = Uncertainty
- Statistical tests quantify certainty
- Margin for error around expectations ...
 - Confidence intervals
- Conclusion:
 - Data inconsistent with assumption
 - Must change cutoff

Could the difference be random?



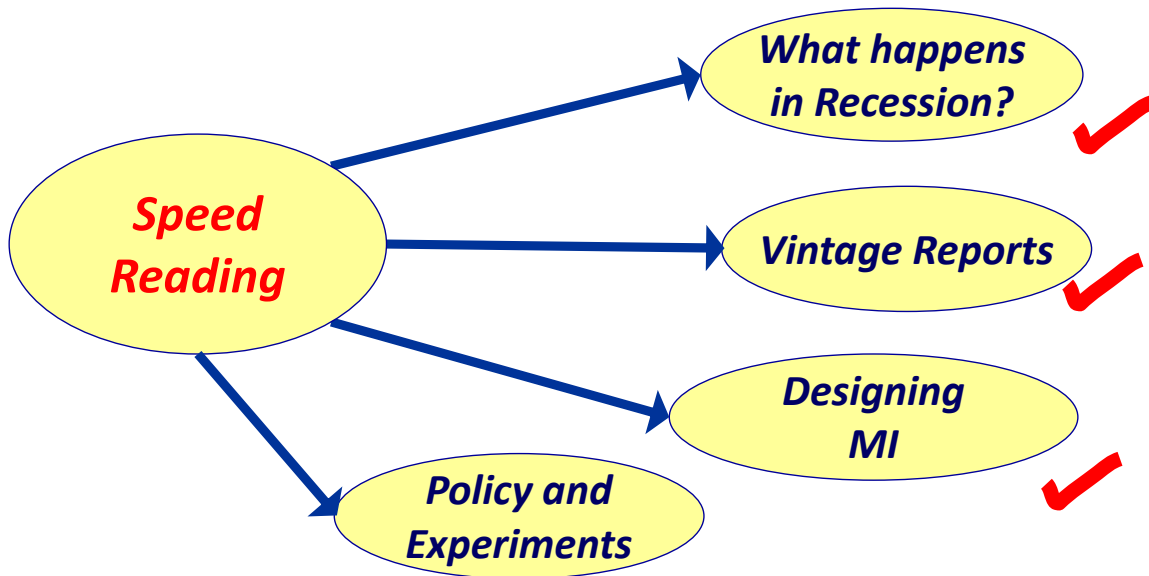
Can you believe your eyes?

Report Design Criteria

- PD – not score
 - If scores didn't exist we wouldn't bother inventing them
- Focus on financials
 - Marginal Cases
 - RAROC measurement
- Early performance benchmarks
- Policies are more important than rating tools
 - Need to make policy assumptions explicit
- Statistical Tests

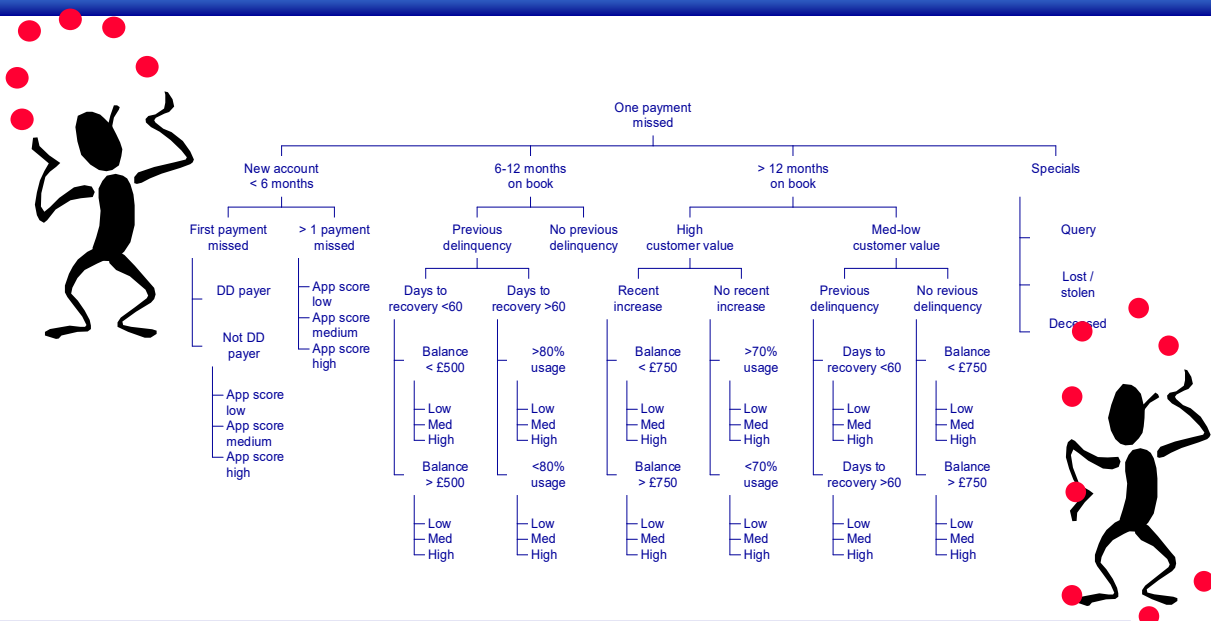
Information Design <—> Structure of Policies

Speed Reading: Structure of Presentation



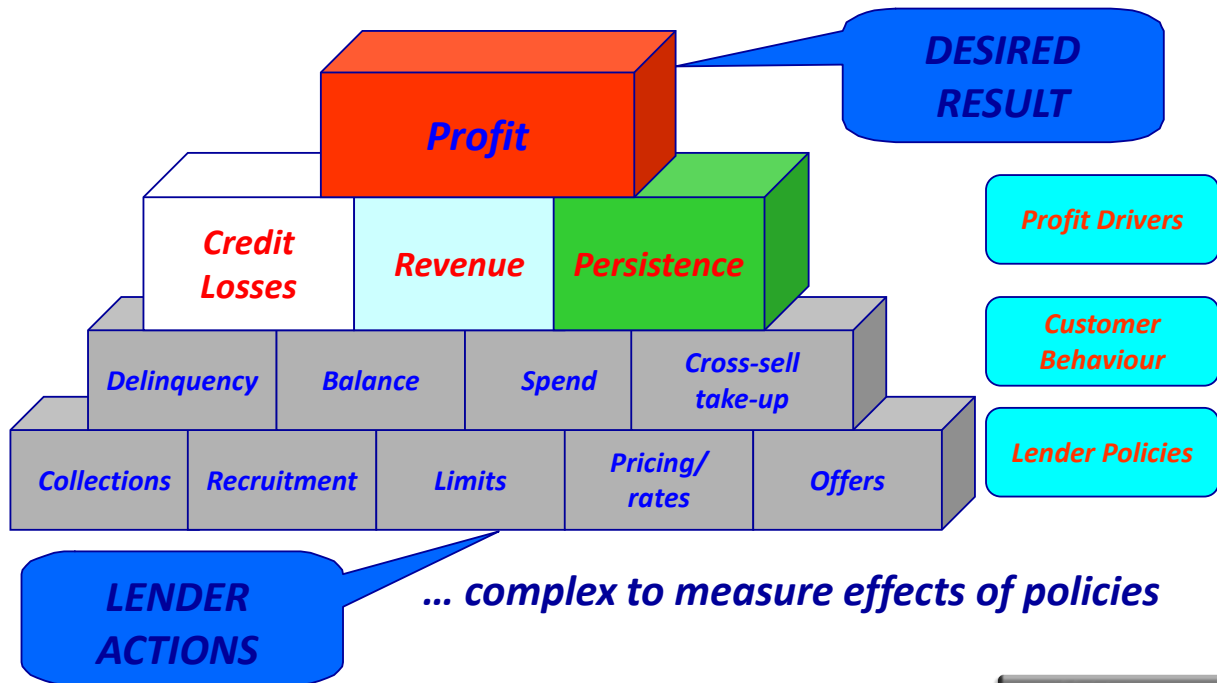
Using portfolio tracking in a recession

Complexity: the enemy ... The decision bush



Does complexity add value? Can you prove it?

Profit Pyramid: Difficult to see the top!



What is a good policy?

- Based on portfolio analysis and experience
 - Discussed and analysed throughout business
- Quantified targets
- Measurable Results - Set standard for performance
- Coherent - Think through overall consequences

Policy Elements

Sources of Business
Recruitment Strategy
Acceptance Cut-off
Pricing
Override Procedures

Targets for Tracking

Population Profile
Override Level
Acceptance Rate
Default Rate
EVA/Contribution Level
Attrition Rate

Keep it Simple!

Credit Policy: Example

Set scorecard cutoff for personal loans

Inputs

- Tracking Results
 - Population Profile
 - Actual vs. Expected PD
 - Scorecard Model Performance
 - Policy Rule Evaluation
- Economic Outlook
 - Interest Rates
 - Unemployment
- Market Analysis
 - Competitors
 - Product Ideas

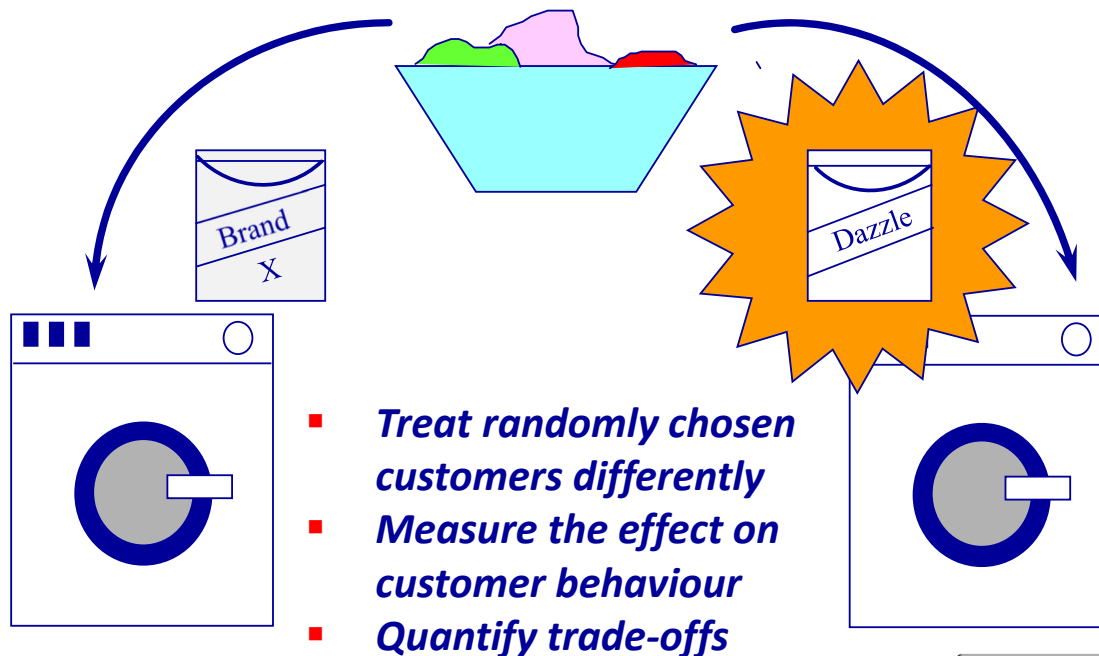
Outputs

- Point in Time Assumptions
 - Reference PD
 - Scorecard Gini
- Operating Policies
 - Scorecard Cutoff
 - Pricing Policy
 - Lending Limits
 - Policy Rule changes
- Portfolio Budget
 - New Lending
 - Outstanding Balances
 - Expected Losses
 - Return on Capital
- Expected Tracking Results
 - See above

Tracking →
Learning →
Change

Experiments

Basic idea



Original approach: horse race

1980s

- Champion: previous strategy - 80%
 - even if clearly inferior to new approach
- Challengers: new strategies - 20%
 - improve treatment for some customers
 - restrict treatment for others
- Once-off experiments

Wrong idea

Goal: Confirm existing ideas

Why champion-challenger doesn't work (most of the time)

- Horse race is fixed
 - Know the winner ahead of time
 - Demonstrating the obvious
- Purpose of experiment badly defined
 - Many experiments have no defined end-point
- Testing too many things at once
- Sample badly chosen - too big/small
- Failed experiments give little information
- Successful experiments don't help formulate next steps
 - One-shot approach

Champion-challenger has slowed change

Cost of Experiment: example

| | Sample Size 50,000 | Limit Increase €1,000 | |
|----------------|-----------------------|--------------------------|--------|
| | | Goods | Bads |
| Bad Rate: | 10% | 45,000 | 5,000 |
| Utilisation | | 3% | 25% |
| Extra Balances | | €1.35m | €1.25m |
| Margin | | 10% | -40% |
| Profit/Loss | | €135k | -€500k |

Overall Cost of Experiment = -€365k
= c. 8 analysts x 1 year

What return on this investment?

Better approach: horse breeding

- Systematically vary treatment
- Understand how customers react to different policy
- No single policy will be a winner for everyone:
 - identify customers for whom a given policy is most profitable
- “Cross” policies to create a champion
 - takes time to find best policy

Experiments buy information – to add value to portfolio

Measuring Results of Experiments

Maximum Limit utilisation

| | < 30% | 30 – 59% | 60 – 94% | 95% + |
|-------------------|-------|----------|----------|-------|
| PD 8% + | -5% | -15% | -21% | -24% |
| 5 to <8% | +4% | +9% | +5% | -6% |
| 2 to <5% | +2% | +12% | +17% | +19% |
| < 2% | +0% | +1% | +3% | +5% |

- **Measures difference in contribution after 9 months**
 - *limit increase vs. no limit increase*
 - *contribution = revenue – bad debt cost*
- **Evaluate for each cell – not on total population**

Build profit-maximising policies

Experimental design

- **Champion:**
 - “best guess”
 - prudent
 - evolves with understanding
- **Control:**
 - freeze champion
 - for duration of test
- **Test:**
 - one dimension of policy
 - for all types of customers
- **Example: increase limits**
 - How does customer behaviour react to limit increase?
 - Balances
 - Delinquency
 - Attrition

Experimental design principles

- Analysis drives experiment
 - experiment is expensive
 - a last resort (when analysis can't give result)
- Most experiments should fail
 - "obviously" good ideas don't need experiment
- Maximum information for minimal exposure
 - keep test groups as small as possible
- Fixed time scale
 - Define end of experiment before start
- Unanalysed experiments deliver no value
 - think through analysis before starting test
- Experiments should be part of an ongoing process
 - Not a one-off idea ...

Experiments are a means, not an end

Past vs. Future Management Process

Past

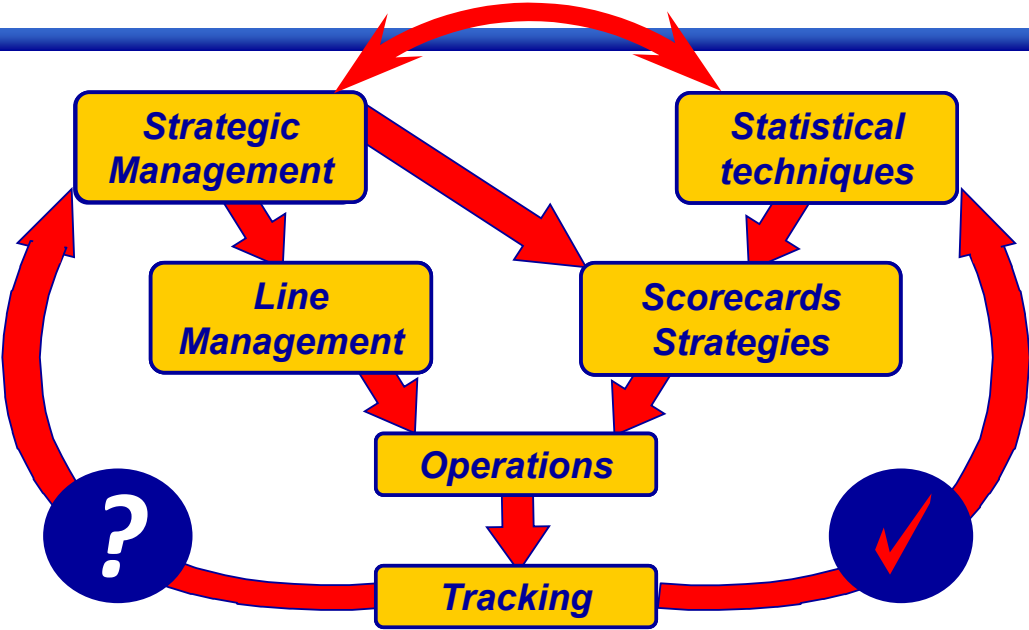
- Model Focus
- Rank-ordering of risk
 - Score only
- Number of cases
- Scores
- Measure total portfolio
- Once-off Experiments
- Sophistication = Complexity

Future

- Portfolio and Policy Focus
- Accuracy of Estimates
 - PD and other
- Financials – Return on Capital
- PD, EL (and EAD, LGD)
- Concentrate on marginal cases
- Systematic ongoing testing
- Sophistication = Simplicity

Technical Feedback -> Management Feedback

Leveraging the Feedback Loop



Information: the key to competitive positioning